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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,722	05/25/2004	Anthony K. Stamper	BUR920030189US1	3721

30449 7590 06/27/2005

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LATHAM, NY 12110

EXAMINER

CHU, CHRIS C

ART UNIT PAPER NUMBER

2815

DATE MAILED: 06/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/709,722

Applicant(s)

STAMPER, ANTHONY K.

Examiner.

Chris C. Chu

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 06 June 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 - 30 is/are pending in the application.
- 4a) Of the above claim(s) 1 - 15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 16 - 30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 5/25/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of Group II in the reply filed on June 6, 2005 is acknowledged. The traversal is on the ground that the search and the examination of the entire application could be made without serious burden. Because the subject matter of all claims 1 – 30 is sufficiently related that a thorough search for the subject matter of any one group of claims would encompass a search for the subject matter of the remaining claims. This is not found persuasive because the method claims of the instant invention, especially, claim 1 recites the following sentence, “selectively etching the alternating layers of dielectric material to remove at least a portion ... of the first dielectric material ... and leaving the second dielectric material as essentially unetched.” This requires a search in specific subclasses of Class 438. However, the apparatus claims have no such limitation, which requires no such search. Therefore, examiner does not agree with the basis of the applicant's argument that the search and the examination of the entire application could be made without serious burden. However, if applicant states for the record that the apparatus claims and method claims are not patentably distinct, then the restriction requirement will be withdrawn.

The requirement is still deemed proper and is therefore made FINAL.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 16, 17, 21, 23, 24, 27, 28 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Lee (U. S. Publication No. 2002/0055243).

Regarding claim 16, Lee discloses in e.g., Fig. 2B - Fig. 2D a semiconductor device, comprising:

- a metal wiring level (202; section 0022, line 3) having alternating layers of a first dielectric material (202c; section 0022, lines 6 – 7) and a second dielectric material (202b; section 0022, lines 9 – 12) and having a first feature (204; section 0022, lines 20 – 21) formed within the alternating layers of first and second dielectric material (see e.g., Fig. 2D); and
- a plurality of openings (air-gaps; section 0025 and see Fig. 2D on this page of Office action) within the first dielectric material.

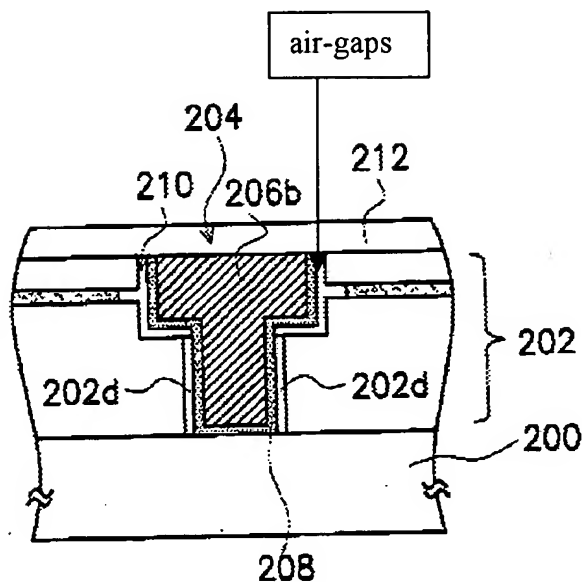


FIG. 2D

Regarding claim 17, Lee discloses in e.g., Fig. 2D the first dielectric material comprising a material that etches selectively to the second dielectric material (section 0022, lines 9 – 11).

Regarding claim 21, Lee discloses in e.g., Fig. 2D a conductive material (206b; section 0025, lines 9 – 10) within the first feature (204).

Regarding claim 23, Lee discloses in e.g., Fig. 3 a semiconductor device, comprising:

- a plurality of alternating first (the layers on top of the elements 302b) and second (302b) insulative layers, wherein the first and second insulative layers have different etch rates (section 0022, lines 9 – 11);
- a first feature (304; section 0026, lines 4 – 5) formed within the first and second insulative layers;
- a plurality of openings (the air-gaps i.e., 310 between the second insulating layers and the element 306a) within the plurality of first insulative layers formed during a selective etch (see Fig. 3).

Regarding claim 24, Lee discloses in e.g., Fig. 3 the first insulative layer comprising a material that etches selectively to the second insulative layer (section 0022, lines 9 – 11).

Regarding claim 27, Lee discloses in e.g., Fig. 3 the first feature (304) comprising a single damascene feature or a dual damascene feature (section 0026, lines 4 – 5).

Regarding claim 28, Lee discloses in e.g., Fig. 3 the openings (air-gaps) being within a wire trench portion (at the location of the element 310) of the dual damascene feature and not a via trench portion (at the location of the element 308; see Fig. 3).

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Regarding claim 30, Lee discloses in e.g., Fig. 3 a conductive material (306a; section 0026, line 6) within the first feature.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 18, 19, 22, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee in view of Naik et al. (U. S. Pat. No. 6,245,662).

Regarding claims 18, 25 and 26, while Lee teaches the use of the first and second dielectric layers and the second dielectric material (202b) being formed by an inorganic dielectric material (FSG; section 0022, lines 15 – 18), Lee does not appear to provide any example of the first dielectric layer's specific composition. Naik et al. teaches in e.g., Fig. 3H, column 3, lines 51 – 63 and column 4, lines 57 – 58 the first dielectric (302) being composed of an organic dielectric material (Silk or Parylene; column 3, lines 51 – 59). It would have been obvious to one of ordinary skill in the art at the time when the invention was made to apply the Silk or Parylene of Naik et al. as the specific material to form the first dielectric layer of Lee as taught by Naik et al. to provide a low dielectric constant material (column 3, lines 53 – 54) and to reduce parasitic capacitance of interconnects (column 3, lines 38 – 42 of Dixit et al. U.S. Pat. No. 6,333,265).

Regarding claim 19, Lee discloses in e.g., Fig. 2D the openings (air-gaps) being within a wire trench portion (at the location of the element 210) of the dual damascene feature and not a via trench portion (at the location of the element 208; see Fig. 2D).

Regarding claim 22, while Lee teaches the use of the metal wiring layer level, Lee does not appear to provide any example of the second metal wiring level on the metal wiring level. Naik et al. teaches in e.g., Fig. 4G a second metal wiring level (408 – 410) on the metal wiring level (302 – 306). It would have been obvious to one of ordinary skill in the art at the time when the invention was made to duplicate the metal wiring level of Lee to form the second metal wiring level on the metal wiring level of Lee as taught by Naik et al. to provide a multi-level structure (column 3, lines 4 – 5).

6. Claims 20 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee in view of Pang (U. S. Pat. No. 6,177,329).

Regarding claims 20 and 29, while Lee teaches a conformal liner (212) over a surface of the alternating layers of dielectric material (202) to seal the alternating layers (see e.g., Fig. 2D), Lee does not appear to provide any example of the conformal liner's specific composition. Pang teaches in e.g., Fig. 15 a conformal liner (138) being composed of SiN (column 9, lines 42 – 43). It would have been obvious to one of ordinary skill in the art at the time when the invention was made to apply the SiN of Pang as the specific material to form the conformal liner of Lee as taught by Pang to provide a chemically sufficiently different material from the previous dielectric layer to be effective as an etch stop (column 9, lines 43 – 45).

*Conclusion*

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Usami, Chooi et al., Morrow, Babich et al., Lin and Lai disclose a multi-layer semiconductor device.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is 571-272-1724. The examiner can normally be reached on 11:30 - 8:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 571-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chris C. Chu  
Examiner  
Art Unit 2815

c.c.  
Thursday, June 16, 2005

  
GEORGE ECKERT  
PRIMARY EXAMINER